

ACCESSION #: 9307210210  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: PLANT E. I. HATCH, UNIT 1 PAGE: 1 OF 9

DOCKET NUMBER: 05000321

TITLE: INSTRUMENT ISOLATION VALVE PACKING LEAK RESULTS IN AN  
AUTOMATIC REACTOR SCRAM

EVENT DATE: 06/15/93 LER #: 93-012-00 REPORT DATE: 07/09/93

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: STEVEN B. TIPPS, MANAGER NUCLEAR TELEPHONE: (912) 367-7851  
SAFETY AND COMPLIANCE, HATCH

COMPONENT FAILURE DESCRIPTION:

CAUSE: X SYSTEM: JA COMPONENT: ISV MANUFACTURER: D232  
REPORTABLE NPRDS: YES

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On 6/15/93, at 1453 CDT, Unit 1 was in the Run mode at a power level of 2436 CMWT (100 percent of rated thermal power). At that time, an automatic reactor scram and isolation of the inboard Group 2 Primary Containment Isolation System (PCIS) valves occurred due to a false low reactor water level signal. Control rods fully inserted as designed. As expected, actual water level decreased immediately following the scram, reaching a minimum level of 34 inches below instrument zero (124.5 inches above the top of the active fuel). At approximately 10 inches above instrument zero, an actuation of the outboard PCIS occurred on an actual low water level condition. The Reactor Feedwater Pumps (RFPs) responded to the actual low level condition and restored water level. No Emergency Core Cooling Systems actuated as a result of the low water level condition, nor were they required to actuate. Reactor pressure decreased as a result of the scram and was then controlled by the Turbine Bypass Valves at approximately 920 psig. Due to misleading level indications,

level increased above the bottom of the Main Steam Lines, resulting in water intrusion into the lines.

The cause of the event was a loose packing nut on an instrument isolation valve becoming disengaged during an instrument calibration. This ultimately resulted in depressurization of the sensing line and a false low reactor water level signal. Corrective actions include repairing the valve, checking other similar installations on both units, performing a walkdown of system piping, and analyzing the effect of water in the Main Steam Lines.

END OF ABSTRACT

TEXT PAGE 2 OF 9

#### PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor Energy Industry Identification System Codes are identified in the text as (EIIIS Code XX).

#### DESCRIPTION OF EVENT

On 6/15/93, at 1453 CDT, Unit 1 was in the Run mode at a power level of 2436 CMWT (100 percent of rated thermal power). At that time, an automatic reactor scram and automatic isolation of the inboard Group 2 Primary Containment Isolation System (PCIS, EIIIS Code JM) valves occurred due to a false low reactor water level signal.

Calibration of reactor water level instrument 1B21-N093B was in progress at the time of the scram. This level transmitter provides a trip signal to the High Pressure Coolant Injection System (HPCI, EIIIS Code BJ) on a high reactor water level condition. The Technical Specifications require the calibration at least once per 18 months. When the nonlicensed Instrument & Controls (I&C) technician performing the calibration attempted to close a 3/8 inch instrument sensing line isolation valve, the packing nut came off the valve bonnet upon contact with the stem handle. Subsequently, the packing gland and packing material partially came out of the bonnet resulting in a substantial bonnet leak which partially depressurized the instrument line.

This instrument line is a variable, or low pressure leg, serving various level transmitters that provide input to the Reactor Protection System (RPS, EIIIS Code JE), the PCIS inboard valves, Reactor Water Level Indicators 1B21-R606A and C, the "A" subsystem of the Feedwater Level Control System (FWLC, EIIIS Code JK), as well as other systems. Consequently, when the instrument line depressurized, a false low water

level was sensed by these instruments, resulting in the reactor scram, automatic isolation of the inboard PCIS valves, and a false low level indication on Main Control Room indicators 1B21-R606A and C. The FWLC System was in "B" control at the time and, therefore, was not affected by the false signal.

The control rods fully inserted as designed. As expected, immediately following the scram, reactor water level decreased due to void collapse in the reactor coolant. The minimum water level reached during the transient was 34 inches below instrument zero (124.5 inches above the top of the active fuel) before level was recovered by the Reactor Feedwater Pumps (RFP, EIIS Code SJ). During the level transient, at approximately 10 inches above instrument zero, the PCIS received a second automatic isolation signal on an actual low level condition, resulting in closure of the outboard PCIS valves.

It is apparent that following the initial depressurization of the instrument line, the packing partially sealed off the bonnet leak. As a consequence, the line partially repressurized, resulting in the associated level instruments tracking reactor water level at lower than actual level. Specifically, Reactor Water Level Indicators 1B21-R606A and C indicated a lower than actual level, and level instruments 1C32-N004A and C, which input to the "A" subsystem of FWLC and/or the Main Turbine and the RFP trip system, were also sensing a lower than

TEXT PAGE 3 OF 9

actual level. The magnitude of this discrepancy between actual and sensed level varied during the event.

During recovery of reactor water level, RFP "B" was secured per procedure to preclude overfilling the reactor vessel. Level continued to increase, and RFP "A" and the Main Turbine tripped on a high reactor water level condition. The actual level at the time of the trip was approximately 68 inches above instrument zero. The trip setpoint is 54 inches. The delay in the trip system actuation was due to level instruments 1C32-N004A and C sensing reactor water level approximately 14 inches lower than actual due to the partially depressurized sensing line.

When sensed water level decreased below the high level trip setpoint, RFP "A" was restarted and placed in automatic level control, aligned to the "B" subsystem of the FWLC system. The "B" subsystem of FWLC is served by a separate instrument sensing line and, therefore, was not affected by the failed instrument line. Consequently, FWLC was sensing an actual high reactor water level condition, resulting in RFP "A" running on minimum flow and not injecting into the reactor vessel.

Reactor pressure initially decreased to approximately 757 psig as a result of the scram and was then controlled by the Turbine Bypass Valves (TBV) at approximately 920 psig.

Licensed operators, in responding to the event, monitored reactor water level. They were aware of a problem associated with a "B" level instrument during calibration that ultimately caused the scram. However, the affected instrument line was unknown and, therefore, the impact of the condition on their instrumentation was also unknown. Reactor Water Level Indicators 1B21-R606A and C appeared to be tracking level after the scram, and Reactor Water Level Indicator 1B21-R606B was off scale high. The high end of the scale is 60 inches above instrument zero. Licensed operators concluded from the displayed level indications that the "B" indicator had failed upscale as a result of the failed sensing line and that the "A" and "C" indicators were accurately displaying level.

The level instruments that provide input to the FWLC System "B" control are served by the same sensing lines that provide input to the "B" Reactor Water Level Indicator. Consequently, the operators, questioning the accuracy of the "B" Reactor Water Level instrumentation, transferred the FWLC System from "B" control to "A" control. The RFP was then being controlled by the "A" FWLC subsystem and periodically injected into the reactor vessel as a result of the sensed false low water level. Control room personnel believed at this point that reactor water level was being maintained within an acceptable band by the RFP. In actuality, reactor water level was high and continued to increase each time RFP "A" injected.

During this time, support personnel, in conjunction with some of the shift personnel, were investigating the cause of the scram. At approximately 1520 CDT, they determined that the depressurized instrument sensing line served the

TEXT PAGE 4 OF 9

"A" and "C" Reactor Water Level Indicators and not the "B" indicator. Therefore, they questioned the accuracy of the "A" and "C" indicators. At that point, the "A" and "C" indicators were displaying a level of approximately 28 inches above instrument zero, but the actual level was approximately 121 inches above instrument zero, as indicated by the floodup range instrument. Consequently, actions were taken to lower level. RFP "A" was secured, and the Reactor Water Cleanup System was aligned to the Main Condenser in order to lower level.

The bottom of the reactor vessel nozzles for the Main Steam Lines (MSLs)

is at 111 inches above instrument zero. Consequently, with the reactor water level greater than 111 inches above instrument zero, reactor coolant was entering the MSLs. It is believed that the coolant was then being diverted to the Main Condenser via the TBVs and MSL drain valves. Procedure 34AB-C71-001-1S, "Scram Procedure," requires that, if reactor water level exceeds 100 inches above instrument zero, the Main Steam Isolation Valves (MSIVs) should be closed. The purpose for closing the MSIVs is to prevent damage to the lines downstream of the MSIVs and to the Main Turbine if water enters the MSLs. During scram recovery, licensed management personnel made a conscious decision not to close the MSIVs based on the following factors: 1) The Main Turbine had already tripped; therefore, water could not enter the Main Turbine. 2) Closing the MSIVs would have complicated scram recovery in that the normal reactor feedwater and the Main Condenser would be unavailable. 3) At the time the action was considered, reactor water level had been accurately assessed and was decreasing. At approximately 1550 CDT, the reactor water level had decreased below the bottom of the MSL nozzles, and water was no longer entering the MSLs.

The repair of the packing leak required isolation of the affected instrument header which serves Emergency Core Cooling System (ECCS) instrumentation, as well as the RPS and PCIS instrumentation previously mentioned. Consequently, in accordance with the Technical Specifications, a Limiting Condition for Operation requiring that Cold Shutdown be achieved within 24 hours if the condition is not repaired was entered. By 0305 CDT, on 6/16/93, the condition had been repaired, the instrument line unisolated, and the Limiting Condition for Operation terminated.

## CAUSE OF EVENT

The cause of the event was component failure in that a loose packing nut became disengaged from an instrument isolation valve bonnet during a maintenance activity. As described previously, when the nonlicensed Instrument & Controls (I&C) technician performing a calibration on level instrument 1B21-N093B began to close a 3/8 inch instrument sensing line isolation valve, upon contacting the stem handle, the packing nut came off of the bonnet. Subsequently, the packing gland and packing partially came out of the bonnet, resulting in a substantial bonnet leak. The associated instrument line serving various level transmitters which provide input to RPS, PCIS, Reactor Water Level Indicators 1B21-R606A and C, the "A" system of the FWLC, as well as other systems, depressurized. Consequently, when the instrument line depressurized, a false low water level was sensed by these instruments, resulting in a reactor scram, automatic

isolation of the inboard PCIS valves, and a false low level indication on Main Control Room indicators 1B21-R606A and C. The FWLC System was in "B" control at the time of the scram and, therefore, was not initially affected by the false signal. However, when control was transferred to "A" during scram recovery, the FWLC System controlled the RFP based on the false low water level signal, ultimately resulting in the high reactor water level condition.

The cause of the high reactor water level condition was the partial repressurization of the instrument sensing line. Typically, a sensing line failure would result in a total depressurization of the line without repressurization. In such a situation, the instrument served by the line would fail upscale or downscale and would not respond to actual water level changes. Such was not the case in this event. It is apparent from a review of the Safety Parameter Display System (SPDS, EIS Code IQ) graphs that the packing leak partially sealed off after the initial depressurization. The graphs show that sensed level on the "A" and "C" instruments initially went downscale. The graphs show that level was restored and then nominally fluctuated as would be expected due to the coolant boil-off and periodic feedwater additions. This phenomenon, coupled with the "B" indicator being upscale, led the operators to conclude that the "A" and "C" indicators were correct and the "B" indicator instrument reference line had depressurized causing it to fail upscale. An additional factor affecting their conclusion was that they knew a "B" level instrument was being calibrated at the time of the event. The operators associated the "B" Reactor Water Level Indicator with the instrument being calibrated and surmised that a problem with the calibration had caused the "B" Reactor Water Level Indicator to fail upscale.

## REPORTABILITY ANALYSIS AND SAFETY ASSESSMENT

This report is required pursuant to 10 CFR 50.73(a)(2)(iv) in that it involved unplanned automatic actuations of Engineered Safety Features (ESF). Specifically, a false low reactor water level condition resulted in automatic RPS and PCIS actuations. Additionally, during the level transient following the scram, an actual low water level condition resulted in the outboard PCIS valves automatically closing.

The RPS provides timely protection against events that could potentially result in damage to the fuel by initiating an automatic scram when appropriate plant parameters exceed design limits. One of the plant conditions that would result in an automatic RPS actuation is a low reactor water level condition. A scram is initiated in this condition to

reduce the heat generation rate of the fuel to prevent fuel damage due to the reduced coolant inventory and, thus, reduced cooling capacity.

In this event, depressurization of an instrument sensing line resulted in two level instruments, which provide input to RPS, failing low and initiating a trip in the RPS logic. As designed, the two inputs were sufficient to trip the one-of-two-taken-twice RPS logic. All control rods fully inserted as designed.

TEXT PAGE 6 OF 9

The PCIS provides automatic isolation capability of Primary Containment penetrations to preclude the release of radioactive material and the loss of reactor coolant inventory in the unlikely event of an accident. The system is designed to actuate on a low reactor water level condition. The level instruments that input to RPS also input to PCIS. Consequently, the false low level condition resulted in isolation of Group 2 PCIS valves. Only the inboard valves closed due to the false low level condition since only the inboard PCIS is served by the level instruments on the affected instrument sensing line. The actual level decrease that followed the scram resulted in an actuation of the outboard PCIS. As a consequence, the outboard Group 2 PCIS valves received an automatic closure signal. The PCIS valves were confirmed to have closed as required.

Prior to the event, reactor water level was at the normal level of approximately 37 inches above instrument zero. As expected, immediately following the scram, actual reactor water level decreased due to void collapse in the reactor coolant. The RFPs responded to the actual decrease and restored level. The minimum level reached in the transient was 34 inches below instrument zero (124.5 inches above the top of the active fuel). The initiation setpoint for HPCI and the Reactor Core Isolation Cooling System (RCIC, EHS Code BN) is 35 inches below instrument zero. Consequently, these systems were not required to initiate and did not do so.

Following the restoration of reactor water level, it continued to increase due to RFP injection as discussed previously. The FWLC System is comprised of an "A" and a "B" reactor water level input, either of which can be selected as the reactor water level input to control the system. The "A" reactor water level input is from level transmitter 1C32-N004A, which is served by the sensing line that depressurized in this event. The "B" level input is from 1C32-N004B, which is served by an independent and redundant sensing line. During the latter portion of the scrap recovery, the FWLC System was selected to "A" level control, which was receiving a false low water level signal. Consequently, the

RFP received a feedwater demand signal and supplied water to the vessel even though actual level was high. The RFP trip system did not function in this event to preclude overfilling the vessel because two of the instruments feeding the two-out-of-three-taken-once logic scheme were sensing the false low level condition.

According to the SPDS graphs, reactor water level peaked at a level of 126 inches above instrument zero. It was estimated that approximately 10,000 gallons of water entered the MSLs for the duration of the overfill condition. A significant quantity of the water most likely vaporized to steam. During this time, the TBVs and the MSL drain valves were open, apparently draining the remaining water to the Main Condenser. Based on the piping configurations of the MSLs, HPCI, and RCIC, and on the postulated fluid flow dynamics, it was concluded that most likely a minimal amount of water entered the HPCI steam supply line and that no water entered the RCIC steam supply line. The HPCI steam supply line is equipped with a steam condensate drain pot that would have drained any water that entered the line.

TEXT PAGE 7 OF 9

Prior to restart of the reactor, General Electric performed an evaluation of the effects of the water entering the MSLs. Based on this evaluation, no safety concerns existed.

Reactor pressure was at 985 psig prior to the event. As expected, following the scram, pressure decreased to approximately 757 psig. Following the Main Turbine trip, the TBVs opened and controlled pressure at approximately 920 psig.

Reactor vessel instrumentation provides monitoring capability of critical vessel parameters and provides the appropriate initiating signals when sensed parameters exceed prescribed limits. In this event, an instrument sensing line depressurized, rendering the instruments served by the line incapable of accurately monitoring their sensed parameters. The instruments associated with the sensing line and the affect of the condition on the associated ESF are as follows:

1B21-N080A/B: These reactor water level instruments provide an actuation signal to RPS and PCIS on a low reactor water level condition. Depressurization of the instrument sensing line caused these instruments to sense a false low level condition and generate a trip signal, resulting in an RPS and a PCIS actuation.

1B21-N093B: This reactor water level instrument provides a trip signal to the HPCI System on a high reactor water level condition to

preclude overfill of the vessel due to HPCI injection. The logic for this trip signal is a two-of-two-taken-once scheme and is not divisionally redundant. This design is partly due to the fact that the HPCI System is unique among ESFs in that it is a single train safety system. As such, the system is not designed to be divisionally redundant. Also, the logic scheme precludes a single spurious signal from causing a trip of the system. As a consequence, the depressurization of the instrument sensing line caused the transmitter to sense a false low water level condition and, given the logic scheme, would have prevented a trip of the system on an actual high level condition.

1C32-N004A,C: These level transmitters do not perform an ESF function; they provide a level signal to level indicators 1B21-R606A and C in the Main Control Room, to the FWLC System (1C32-N004A only), and to the Main Turbine and RFP trip system. The affect of the sensing line failure on this instrumentation was previously discussed.

1B21-N095A: This instrument is a level transmitter and performs two functions. First, it provides a trip signal to the RCIC System (a non-ESF) on a high reactor water level condition to preclude overfill of the vessel due to RCIC injection. The logic for this trip signal is a two-of-

TEXT PAGE 8 OF 9

two-taken-once scheme and is not divisionally redundant. This design is partly due to the fact that the RCIC System is a single train system. As such, the system is not designed to be divisionally redundant. Also, the logic scheme precludes a single spurious signal from causing a trip of the RCIC System. As a consequence, the depressurization of the instrument sensing line caused the transmitter to sense a false low water level condition and, given the logic scheme, would have prevented a trip of the system on an actual high level condition.

The second function of this transmitter is to provide a permissive signal to the Automatic Depressurization System on a low reactor water level condition. The sensing line failure in this event would have caused the permissive signal to be generated at a higher than required level. Consequently, the failure would not affect the ability of ADS to function in an accident. Furthermore, the other inputs required to initiate the system would preclude premature initiation of the system.

Based on the above information, it is concluded that this event had no adverse impact on nuclear safety. This assessment applies to all operating conditions.

## CORRECTIVE ACTIONS

The packing for isolation valve 1B21-N093B-IV-1 was re-installed and the packing nut torqued.

The packing nuts for instrument valves in Unit 1 were checked. Twenty-three packing nuts were found to be less than snug. The nuts were subsequently tightened.

During the next Unit 2 Refueling outage, the Unit 2 instrument packing nuts of the type involved in this event will be checked for proper tightness.

A walkdown of the MSLs downstream of the MSIVs was performed and no signs of damage were identified.

General Electric performed an evaluation of the water in the MSLs.

## ADDITIONAL INFORMATION

No systems other than those previously identified in this report were affected by this event.

## TEXT PAGE 9 OF 9

One similar event occurred within the past 2 years in which a pressure perturbation on an instrument sensing line resulted in an automatic reactor scram. This event was addressed in the LER 50-321/91-17, dated 10/9/91. In this event, a hand-held instrument fell and struck a sensing line drain valve stem handle. The impact of the fall resulted in the valve partially opening and the sensing line completely depressurizing. Corrective actions for this event included counseling personnel and issuing a plant-wide directive. These actions had no bearing on the condition of the packing nut and, therefore, could not have prevented this event.

## Failed Component Information:

Master Parts List Number: 1B21-N093B-IV-1

Manufacturer: Dragon Valve, Inc.

Model Number: 60N

Type: Instrument Manifold Valve

Manufacturer Code: D232  
EHS System Code: JA  
EHS Component Code: ISV  
Reportable to NPRDS: Yes  
Root Cause Code: X

ATTACHMENT 1 TO 9307210210 PAGE 1 OF 1

Georgia Power Company  
40 Inverness Center Parkway  
Post Office Box 1295  
Birmingham, Alabama 35201  
Telephone 205 877-7279

J. T. Beckham, Jr. Georgia Power  
Vice President - Nuclear  
Hatch Project the southern electric system

July 9, 1993

Docket No. 50-321 HL-3398  
005807

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, D.C. 20555

Edwin I. Hatch Nuclear Plant  
Licensee Event Report  
Instrument Isolation Valve Packing Leak  
Results in an Automatic Scram

Gentlemen:

In accordance with the requirements of 10 CFR 50.73(a)(2)(iv), Georgia Power Company is submitting the enclosed Licensee Event Report (LER) concerning an instrument isolation valve packing leak which resulted in an automatic reactor scram. This event occurred at Plant Hatch - Unit 1.

Should you have any questions in this regard, please contact this office.

Sincerely,

J. T. Beckham, Jr.

JKB/cr

Enclosure: LER 50-321/1993-012

cc: Georgia Power Company  
Mr. H. L. Sumner, General Manager - Nuclear Plant  
NORMS

U.S. Nuclear Regulatory Commission, Washington, D.C.  
Mr. K. Jabbour, Licensing Project Manager - Hatch

U.S. Nuclear Regulatory Commission, Region II  
Mr. S. D. Ebnetter, Regional Administrator  
Mr. L. D. Wert, Senior Resident Inspector - Hatch

\*\*\* END OF DOCUMENT \*\*\*

---